

NOTES ON BUTTERFLY MIGRATION.

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There is a voluminous literature on the migration of butterflies, but as the published records refer to many different species, our knowledge concerning most of them remains more or less fragmentary. The problems connected with this interesting behavior can be solved only with the aid of the accumulated data from many observations, and the following notes are offered with that end in view.

Aglaia californica Bdv. A very extensive migratory flight was observed by Mr. K. M. Fender, of McMinnville, Oregon, who kindly sent me the following data. The flight was observed at Crater Lake, Oregon, on August 15th and 16th, 1930. Unidirectional flight commenced at about noon on each day and continued until nearly six P. M. The butterflies were flying in a general northerly direction along the top of the range, at an altitude of about eleven thousand feet above sea-level. The distance between individual butterflies was usually from three to six feet, and their flight was at a height of from four to six feet above the ground. The insects avoided such obstacles as large boulders by flying around them, not over them. Females seemed to be slightly in excess; no mating nor ovipositing were noted. In the mornings the butterflies remained at rest among the pines and hemlocks, though a few would fly about haphazardly in the immediate vicinity of their resting places. This morning inactivity might have been due to temperature or wind conditions, but data on these are lacking. Mr. Fender states that such migratory flights of this species have occurred before in the same region, though they are infrequent events, and seldom so prolonged as the present instance. Wallis, '12, and Webster, '13, have reported similar flights of the same species.

Catopsilia philea Joh. Besides my own observation of this species in Missouri (O'Byrne, '31), occurrences of it in 1930 at three other widely separated localities in the North have been recorded; these are Wisconsin (Dornfeld, '31), Connecticut (Haskin, '31), and Pennsylvania (Tietz, '31), and they indicate that extensive migration occurred during the summer of 1930. Observers in southern localities may be able to enlighten us as to the extent to which the drought of 1930 affected vegetation, particularly the food plants of this species (*Cassia* and other

legumes), in the South, or whether unusual abundance or overcrowding took place.

Eurema mexicana Bdv. Occasional solitary and much bedraggled butterflies of this southwestern species appear in the vicinity of St. Louis, Missouri, late in the fall. Several local collectors possess such specimens; the most recent record is one captured by Dr. E. P. Meiners, of St. Louis, at Ranken, Missouri, on October 13, 1931. The appearance of so frail a butterfly hundreds of miles away from its usual haunts may be due to favorable winds, although Lutz, '27, considers the flight of insects as being more frequently against the wind than with it. He suggests, however, that even when they fly against the wind, negative progress in the direction of their flight can be made. There are a number of published records of migration in other species of the genus *Eurema*. Many are referred to by Williams, '30, including *E. lisa* Bdv. & Lec., *nicippe* Cram., *deva* Dbl., *albula* Cram., *persistans* Butl., and *lydia* Felder, in North and South America, besides six other species in the Old World. Some of these have been seen migrating in enormous numbers. Because so many species of this genus show migrating propensities, and because of the unusual occurrence of *mexicana* in the St. Louis region, I regard it as a migrant here, and not a permanent part of the local fauna.

Lerodea eufala Edw. This is a denizen of the Gulf States, although occasional specimens have been seen in the North. Brower, '30, reports it "uncommon" near Willard, Missouri; records near St. Louis are extremely rare, and it has been seen but once by the writer—on November 4, 1931, when three specimens, a male and two females, were taken at Ranken, Missouri. All local records are late autumn ones; the absence of individuals belonging to the first brood makes it very probable that our specimens are strays from the South.

Calpodus ethlius Cram. The wandering habits of this tropical species are well-known, and there are many records of its northern occurrence, especially along the Atlantic Coast. Among these are Norfolk, Va., West Raleigh, N. C., West Grove, Pa., Washington, D. C., and others, mentioned by Chittenden, '12, two New York City records cited by Williams, '20, and West Farms, N. Y., referred to by Holland, '31. Mr. R. C. Lange, of Webster Groves, Missouri, supplies the following data on the occurrence of this species in Webster Groves. He found ten mature larvae

on *Canna* on July 22nd, 23rd, and 29th, 1927. The first one pupated on July 25th, and the butterfly, a female, emerged on August 10th. The others emerged between August 11th and 15th. No one seems to have captured the adults in this locality. In connection with the probable migration of this butterfly, Chittenden, '12, found that the larvae and pupae were killed by frosty weather in Washington, D. C., but he suggests that the species may be extending its distribution northward by obtaining footing in greenhouses where *Cannas* are grown. In the absence of definite information regarding such establishment of it in the North, and in the light of what is known of its migrating habits, its occurrence in Missouri is best interpreted as migrations of individuals from the South, which breed freely, but whose offspring subsequently perish from the cold of winter.

All but one of the foregoing records belong to the years 1930 and 1931, years that are memorable for unusual captures of butterflies in many parts of the country, far astray from their proper localities. Both of these years were marked by wide-spread and long-continued drought. It is difficult to establish a direct relation between high temperature, low humidity, or both, and a "wanderlust" in butterflies that would lead to long migrating flights. An indirect relation can be seen in the effects of drought conditions upon vegetation, resulting in overcrowding; I have also suggested overcrowding in connection with the migration of *Dione vanillae* Linn. (O'Byrne, '32). Under these extreme conditions, the female butterflies may not be able to find plants on which to deposit their eggs, or there may be an insufficient amount of suitable foliage to enable their progeny to reach maturity. In such a situation, only migration of the females could insure the perpetuation of the species. Failure of plants for food for the young could hardly impel the males to migrate; but since it is known that males do migrate in certain species, it is probably for the purpose of mating. When migration is not coincident with a shortage of food plants, the causes underlying it are more difficult to ascertain, and the solution of this problem demands further investigation.

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An Interesting Northern Record.—While collecting on the side of a low mountain in Antrim, N. H., on June 14, 1932, I was greatly surprised to find a specimen of *Gnorimella maculosa* Knoch clinging to a leaf of a maple-leaved *Viburnum* which was then in flower. The day was cloudy and damp and there were few beetles on the flowers.—C. A. Frost, Framingham, Mass.